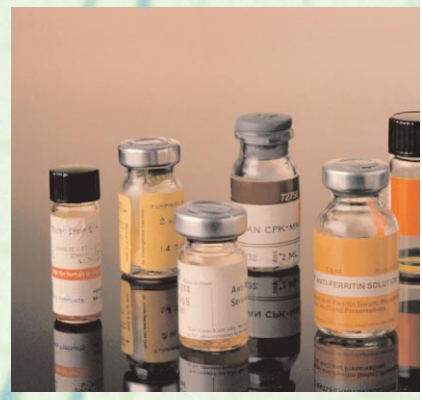
NURSE SENSITIVE PATIENT OUTCOMES: MONITORING REPORT

November 2004



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Nurse Sensitive Patient Outcomes
Monitoring Report
2004

Prepared for the Rhode Island Department of Health

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Introduction

The following is an update on the report *Patient Outcomes and Nurse Sensitive Indicators: A National Overview* (October, 2001) and its May 2002 follow-up. The purpose of these reports is to examine the evolution of research regarding the identification of patient outcomes sensitive to nursing care via an on-going review of the empirical literature. In addition, monitoring of select outcomes for 2002 and 2003 was initiated.

Update: Meta-Review of the Literature

The method used to update the original report on nursing sensitive patient outcomes is unchanged. A comprehensive review of the nursing, medical, and healthcare management literature was conducted in the search for empirical evidence regarding the relationship between select patient outcomes and nursing care.

Few studies have emerged since the last report that add considerable knowledge about nursing sensitive patient outcomes. Four studies of relevance were found, three of which were conducted at the unit level and one at the institutional level of analysis. Institutional level analysis is criticized for an inability to identify specific aspects of the context of care, such as unit level structures and processes that may affect outcomes. This level of understanding is necessary for administrators to effect practical, targeted change in the practice setting (Whitman, et al, 2002). Although unit-level analysis has occurred in the past, the cluster of unit-level studies in this monitoring report may signal a growing awareness that work environment conditions, including but not limited to staffing, are relevant to patient outcomes.

Hospital level analysis

The first study by Cho, Ketefian, Barkauskas, and Smith (2003) examined the effects of nurse staffing on patient falls and adverse medication events as well as the adverse outcomes of pressure ulcers, pneumonia, urinary tract infections (UTI), wound infections, and sepsis. In addition, their research included an analysis on the effect of these outcomes on morbidity, mortality, and costs; however, this latter line of inquiry extends beyond the scope of this monitor. Their sample included 232 California hospitals involving 124,204 patients in 20 surgical DRGs during fiscal year 1998-1999.

Of the adverse events studied, two outcomes were found to have statistically significant relationships with nurse staffing, pneumonia and pressure ulcers. As expected, nurse staffing was found to be inversely related to the occurrence of pneumonia. Surprisingly, pressure ulcers were positively correlated with total nursing care hours, a finding also noted by Blegen, Goode, and Reed (1998). The authors suggest this unexpected finding may be due to incomplete risk adjustment that would identify surgical patients at high risk for pressure ulcers (i.e., immobility, malnutrition, operating time, etc.).

Cho and colleagues (2003) provide interesting insight into the size of the effect of changes in nurse staffing on the odds of a patient experiencing pneumonia. They found that the probability of pneumonia is 0.23% lower for 1-hour increase in RN time. The result of adding one hour of RN time is a decrease in the overall pneumonia rate from 2.59% to 2.36% (p.75).

The statistically significant inverse correlation between nurse staffing and pneumonia found in Cho, et al's work is consistent with the majority of previous studies examined in this monitor. Five of the previous six studies in the meta-review to date found the same relationship.

The work by Cho and colleagues above and those in the previous meta-review report on institutional level studies. Researchers have considered unit level studies suspect in terms of generalizability and often quality. At the same time, the emerging line of inquiry at the unit level and their increasing rigor warrants inclusion of three recently published reports.

Unit-level analysis

Three studies conducted at the unit level were published since the last monitoring report. Boyle (2004) reported on the relationship between select patient outcomes and nurses' perceptions of control in their practice, nurse-physician collaboration, nurse management support, and the specialization of nursing practice. These contextual variables include, but are not limited to perceptions of staffing. The outcomes studied were patient falls, nosocomial pneumonia, UTI, pressure ulcers, cardiac arrest, mortality, and failure to rescue. The objective of this single site, exploratory research suggests that the study of nursing sensitive patient outcomes is beginning to discern how the structures and processes in which nursing care is practiced impact outcomes, as called for by Sovie and Jawad (2001) and described in the last monitoring report. Boyle found statistically significant results in the predicted inverse relationship between autonomy/ collaboration with failure to rescue and UTIs; nurse management support and lower deaths and pressure ulcers, although higher rates of failure to rescue; and high continuity/specialization with lower pneumonia, cardiac arrest, and shorter LOS.

The last two unit level studies investigate outcomes that are, in general, not found in hospital-level studies and thus not followed in this monitoring process to date. Public, hospital level databases do not provide the quality data necessary for analysis of many of these important outcomes such as patient falls and adverse drug events. Researchers investigating these outcomes rely in large part on self-report data that is not collected in any uniform systematic way across institutions, the result is single site studies or small, multi-hospital analysis. They are reported here in order to reveal the evolution of nursing sensitive patient outcomes research.

Potter, Barr, McSweeney, and Sledge (2003) examined the relationship between nurse staffing (total nursing care hours and percent RN hours) and the patient outcomes of falls; medication errors; patient self-report of symptom management; their self-care and health status; and post-discharge patient satisfaction. The one-year study was conducted in a single, large tertiary center in the Midwest using 2000 to 2001 data. Statistically significant relationships in the expected negative direction were found between total nursing care hours

and the patients' report of distress, willingness and ability to care for themselves, symptom management, self-care, and falls.

Notable is Potter, et al's efforts to determine what outcomes are affected by the percent of RN hours (staff mix), an important consideration noted by other researchers in this area of study working at the hospital level of analysis (Blegan & Vaughn, 1998; Needleman & Buerhaus, 2001). Statistically significant inverse relationships were found between the percent of RN hours and the patients' report of pain, ability to participate in care, health status, and five of the seven dimensions of patient satisfaction included in the study. A statistically significant relationship between total nursing hours, but not RN hours, and patient falls was found. This study suggests that changes in total nursing care hours and the percent of RN hours have differing effects on positive patient outcomes and no relationship to other outcomes including medication errors. However, conflicting results are evident in the literature. For instance, different from Potter et al's findings, Blegan et al (1998) concluded that units with higher percentages of RN's had fewer patient falls. Conflicting results have been common throughout this meta-review process.

The last study by Whitman, et al (2002) involved 95 patient care units in 10 acute care hospitals. This study differs from other unit level analysis in that it examines differences between types of in-patient units (cardiac ICU, non-cardiac ICU, cardiac intermediate care, non-cardiac intermediate care, and medical-surgical services). They examined the relationship between nurse staffing and central line blood-associated infection, pressure ulcers, falls, medication errors, and the duration of restraint use. Results indicated no statistically significant relationship between staffing and central line infection and pressure ulcer rates across like units. However, there was a significant inverse relationship between nurse staffing and falls in cardiac intensive care, medication errors in cardiac and non-cardiac intensive care units, and restraint rates in the medical-surgical units (p.633). The authors conclude that the influence of staffing on outcomes may differ depending on the type of patient care unit. In addition, when present, there is an inverse relationship between staffing and adverse outcomes at the unit level.

Implications for the Identification of Nursing Sensitive Patient Outcomes

Of the numerous outcomes previously discussed, only pressure ulcers, pneumonia, and urinary tract infections are among the outcomes currently being monitored in Rhode Island based on previous reports. Findings herein concerning the relationship between nurse staffing and these outcomes at both the hospital and unit-level of analysis support earlier conclusions that pressure ulcers, pneumonia, and urinary tract infections are emerging as empirically supported nursing sensitive patient outcomes. Initially, adverse events including patient falls and medication errors were not included in this study due to insufficient empirical evidence of a relationship to nurse staffing; however, monitoring seems to indicate this condition may be changing. Monitoring might be expanded, as it was in this report, to include unit-level and single-site studies that investigate the effect of the work environment, its processes and structures, on patient outcomes though there exists no means of monitoring these relationships in Rhode Island at the current time.

As noted in the report *Patient Outcomes and Nurse Sensitive Indicators: A National Overview* (October, 2001), the Rhode Island General Assembly (July 20, 2000) called for quality care initiatives involving the identification, collection, and measure of performance indicators. This report continues to fulfill the mandate that consideration be given to the nursing sensitive performance measures to be reported on and the specific charge to 1) the identify patient outcomes potentially sensitive to nursing care; 2) select indicators found to have an empirically supported relationship to nurse staffing; and 3) the determine the availability of RI data for possible monitoring.

Nursing Sensitive Patient Outcome Monitoring
in Rhode Island 2002 and 2003

Purpose

The purpose of this data analysis is to implement a system of monitoring three nursing sensitive patient outcomes and length of stay. The outcomes that were chosen are the result of an on-going meta-review of the literature that suggests pneumonia, pressure ulcers, and urinary tract infections are directly influenced by nursing care. Additional nursing sensitive patient outcomes are emerging in the literature as well; however, findings across studies are often conflicting indicating a lack of agreement at this time.

The methodology employed is comparable to that employed by Needleman, et al (2001). It is necessary to revise the statistical program provided by these researchers annually as a result of changes in procedure coding rules from year to year. In addition, the categorization of medical patients and major surgical patients in this study was based on Needleman et al's work using the Complications Screening Program (CSP). Complicating the replication of the original study is the fact that the CSP is no longer maintained by the authors (Iezzoni, correspondence 7/29/04). Although the CSP has not been updated, this study requires that when relevant additions are made in DRG codes, they must be assigned to a category, medical or major surgery. These two factors, changes in procedure codes and the categorization of diagnoses as medical and major surgical, result in changes in the original coding rules used by Needleman et al in their study.

Sample

The source of data used in the study are the publicly reported diagnosis codes obtained from hospital discharge abstracts from acute care hospitals throughout the state. The problem of identifying preexisting conditions exists since they are not explicitly identified in the discharge abstract. In order to restrict pre-existing conditions from the sample, this study employs the method used by Needleman to exclude patients when the conditions are likely to have been present on admission and were therefore not a result of the quality of nursing care provided but rather associated with the health status of the patient pre-admission. In addition, adverse conditions that are typically associated with the primary diagnosis were restricted.

For example, the sample excludes patients in the major diagnostic category of 'kidney and urinary tract' diagnoses from the urinary tract infection rates since these patients are considered to be at high risk for developing the complication as a result of their functional health status. The restrictions applied in Needleman's study were based on expert clinical judgment. The goal is that after applying the restrictions, patients left in the sample with the adverse outcome are more likely to have experienced an iatrogenic complication.

The 2003 sample size for the adverse outcomes varied as a result of the restrictions applied. The medical pool for UTI and pneumonia has a sample size of 101,039 while the medical sample pool for pressure ulcers was 43,927 (a pressure ulcer restriction required the exclusion of patients with a LOS < 4 days thereby significantly reducing the sample size). The major surgery pool sample was 18,470 for UTI and pneumonia and 8,473 for pressure ulcers. The total pool size was greater in 2003 than 2002 (1,710 more patients for UTI and pneumonia and 466 more pressure ulcer patients, or a 1.45% and 0.89% increase respectively).

TABLE 1 Nursing Sensitive Patient Outcomes 2002/2003

	RI		Needleman, et al (2001) 1997 data		***RI***		Needleman, et al (2001) 1997 data	
	Medical		Overall medical (11 state range)	MA medical	*Major surgical*		Overall major surgical (11 state range)	MA major surgical
	2002	*2003*			*2002*	*2003*		
UTI	*5.45%*	*5.42%* *n=5.479*	6.3% (4.92-7.46%)	5.52%	*2.15%*	*2.70%* *n=498*	3.3% (2.73-6.95%)	3.31%
Change		▼ 0.03 %				▲ 0.55 %		
Pneumonia	*3.07%*	*2.41%* *n=2,434*	2.34% (0.56-3.57%)	0.56%	*2.99%*	*3.12%* *n=576*	1.24% (0.12-5.35%)	0.12%
Change		▼ 0.66 %				▲ 0.13 %		
Pressure ulcer	*4.81%*	*4.90%* *n=2,153*	7.21% (3.08-9.2%)	3.08%	*2.54%*	*2.70%* *n=229*	5.8% (2.87-7.07%)	2.99%
Change		▲ 0.09 %				▲ 0.16 %		
ALOS	*5.02*	*5.02*	5.02 (3.63-6.31 days)	4.79	*4.60*	*4.64*	4.67 (3.91-8.09 days)	4.15
Change		-				▲ 0.04		

Findings

The agreed primary objective of this monitor is to observe trends that may emerge in the Rhode Island data over time. The objective to compare rates with Massachusetts was not achieved given differences in databases. Rhode Island's data reflects the CMS DRG while Massachusetts data is based on APR-DRG's allowing for greater severity specificity. Several attempts were made to find a crosswalk between the data sets, however none was found in time for this report. Meanwhile, the 1997 rate of occurrence data used in Needleman et al's work will be included as a point of comparison for Rhode Island findings.

Urinary Tract Infections (UTI)

The rate of UTI in the RI medical population in 2003 is 5.42%, a slight decrease from 2002 (5.45%). The rate falls within the range described by Needleman, et al, (4.92-7.46%) and below the eleven state average in the study. The RI rate also falls below the reported MA rate of 5.52% in 1997.

The UTI rate in 2003 for RI major surgical procedures is 2.7%, slightly greater than 2.15% finding for the previous year. This rate is less than both the overall rate in Needleman's study and less than the Massachusetts rate.

Pneumonia

The RI medical population rate for pneumonia in 2003 was 2.41%, a drop of 0.66% from 2002. This more favorable rate is comparable to the overall medical rate for pneumonia in the Needleman study of 2.34%.

Major surgical patients in RI had a 3.12% rate of pneumonia, which is considerably greater than the 1.24% rate reported by Needleman. The 2003 rate represents a 0.13% increase from the 2002 findings. Ten of the eleven states in the Needleman study were within the range of 0.12% (MA) to 2% (SC). Only one state in the original study exceeded the RI rate (5.35% WV) in 2002 and 2003.

Pressure Ulcer

The rate of pressure ulcers in the RI medical population in 2003 was 4.9%, a slight increase of 0.09% since 2002. The overall rate reported by Needleman was 7.21%, thus the RI findings continue to be favorable.

Pressure ulcers were found to occur in 2.7% of major surgical cases in RI in 2003, a 0.16% increase since 2002. However, both rates are below the range found in the eleven state comparison group (2.87-7.07%) and comparable to MA (2.99%).

Length of Stay

The overall length of stay (LOS) for the RI medical patients included in this study was unchanged between 2002 and 2003 at 5.02 days. This is precisely the LOS cited as the overall LOS for the eleven states in the original study (range: 3.63 to 6.31 days), but higher than the MA LOS in 1997 of 4.79 days.

Major surgical patients in RI during 2003 had a 4.64 LOS, only a slight change from the previous year (4.60 days). These rates closely approximate the overall major surgical rate reported by Needleman as 4.67, and just under one-half day more than MA in 1997.

Discussion

Table 1 reflects the average rates of nursing sensitive patient outcomes found in the medical patient risk pool and the major surgery risk pool in Rhode Island for 2002 and 2003, the overall rate and ranges from Needleman et al's study of eleven states and Massachusetts rates of occurrences in 1997. The methodology used is comparable to the original study; however, adjustments in programming were required as a result of coding revisions over time. The magnitude of the RI rates seems credible. The rates of occurrence for medical patients range from a low of 2.41% for pressure ulcers to 5.42% for urinary tract infections. The occurrence rates in the major surgery pool ranged form a low of 2.7% in both UTI and pressure ulcers to 3.12% in pneumonia, similar to the variations in Needleman's data.

Needleman noted that medical patients "tend to have more co-morbidities, putting them at higher risk of experience complications" (p.62). Consistent with the comparison study, the RI occurrence rates are, as expected, higher in the medical pool of patients than in the surgical pool with one exception – pneumonia in the surgical population for 2003 (3.12%). This finding differs from RI's 2002 (2.99%) where the pneumonia rate for medical patients were found to be higher than surgical as expected. Only one state in the original study of eleven (WV 5.35%) was reported to have a rate higher than RI, making pneumonia an adverse outcome of particular interest since the morality rate for pneumonia complications is reported by Needleman to be substantial. However, the RI rate of pneumonia in the surgical pool is comparable to that found in the original studies review of Medicare (not all payer) data (3.42%). The possibility exists that the RI patient population mirrors an overall high proportion of elderly in the state; thus, the RI occurrences of pneumonia more nearly reflect the expected rate for Medicare patient than the all-payer rate.

There was little change in the RI LOS between 2002 and 2003. Findings are very comparable to the overall LOS noted in the original study. However, the LOS for major surgery is nearly one-half day longer than the reported MA rate in 1997, a significance that cannot be explained by differences in regional practice protocols. To some extent, patients benefit from a lower LOS as the chance of iatrogenic adverse outcomes and events is reduced.

Overall, this first report comparing changes in the occurrence rates of adverse patient outcomes in Rhode Island between 2002 and 2003 demonstrates little change. Of note however, is the rate of pneumonia in major surgical patients. Although within the eleven state comparable range, the slight increase in 2003 and the fact that the rate superceded by only one state in the comparison group causes this to be an indicator worthy of continued monitoring; however, findings do not reveal any results far afield of comparative data. Concern about the validity and limitations of using administrative data for quality monitoring as discussed in *Patient Outcomes and Nurse Sensitive Indicators: A National Overview* (October, 2001) remains an issue that researchers in this field continue to struggle with.

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